



Dear all

It feels like only yesterday that the first team of volunteers arrived at the Kuruman River Reserve (KRR), yet here we are a successful and exciting 3 years later! Clearly, time flies when you're having fun!

Many thanks for your dedication to our research objectives: your many hours in the field and your many lines of data. But thank you too for all your ideas, enthusiasm and encouragement. It is always a special and humbling experience to share the magic of meerkats with an eager new apprentice, and our team has had that honour 49 times this year!

It has been an immensely rewarding and productive experience to host Earthwatch teams at the Kuruman River Reserve, and we sincerely hope you all took with you as much insight and as many fond memories as we did by having you join us.

Yours sincerely,

Tim Clutton-Brock, Marta Manser, Tom Flower and Helene Brettschneider

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Meerkats of the Kalahari

Principal Investigator(s): Prof. TH Clutton-Brock FRS; Prof. M Manser

Position/Affiliations: Large Animal Research Group, Department of Zoology, University of Cambridge; Verhaltensbiologie, Zoologisches Institut, Universität Zürich

Research Site(s) (geographic location, include coordinates if known, e.g. Lat/Long): Kuruman River Reserve, Northern Cape Province, South Africa (S26°57' E21°49')

Local Management Status of the Research Site(s) (e.g. National Park, RAMSAR Site, World Heritage Site, IBA etc.):

The site is privately owned and managed by the Kalahari Research Trust, a body comprising several scientists from the UK and South Africa

Scientific names of primary species being studied (if appropriate):

Suricata suricatta (Schreber 1776)

SECTION I

Data Collection and Results

a) **Give a concise account of the data you have collected during the past field season.**

Meerkat Research

Data collection is conducted by 9 volunteers focussing on general behavioural data, weights sequences, breeding status and pregnancy, pup social foraging, pup begging, pup and sub adult sexual size differences, anxiety, heart rates and tuberculosis. Earthwatch volunteers primarily focus on foraging strategies and interactions with Kleptoparasitic birds (birds that feed by stealing the prey caught and killed by other animals).

Biodiversity surveys

The aim of the Biodiversity surveys is to take a detailed inventory of what organisms are present in the reserve, and to try to establish the distribution patterns and relative densities at which they occur. Walking 1km transects (lengths or patches of area in which data is collected) on the reserve in order to document the biological diversity was one of the responsibilities of Earthwatchers (Figure 1). This included documenting the presence of burrows, termite mounds, trees, invasive alien plants and the nests of a couple of sociable weavers (species of bird). Earthwatchers covered an additional 35km on the reserve during 2007.

Game Surveys

The purpose of the game survey on KRR (Kuruman River Reserve) is to set up a comprehensive database of the numbers of large antelope on the reserve. This forms an important part in the effective management of the reserve and provides information about the spatial density of various antelope species and their use of the available land.

The aim is to set up a baseline antelope inventory by doing periodic game drives through the reserve, while documenting the location, numbers, age and sex of the antelope species encountered.

Data is then entered into a long term database for subsequent usage. Earthwatchers completed 8 game surveys during 2007.

Vegetation Surveys

We aimed to take a detailed inventory of what plants are present in the reserve, and to try to establish the distribution patterns and relative densities at which they occur.

Volunteers assist management by conducting vegetation surveys in a number of selected plots on the reserve. Plots measuring 10m x 20m will be marked out, and within these plots the volunteers will record 200 points, noting amongst other things, plant species encountered and growth form.

b) What progress have you made towards achieving your original objectives?

Several papers and theses have been published detailing advances in our research:

Biodiversity survey progress

Walking 1km transects on the reserve in order to document the biological diversity was one of the responsibilities of Earthwatchers. This included documenting the presence of burrows, termite mounds, trees, invasive alien plants and the nests of a couple of sociable weavers. Earthwatchers covered an additional 35km on the reserve during 2007.

Game survey progress

During 2007, a total of 5 game drives were completed by Earthwatch teams. The numbers, ages and sexes of all Gemsbok, Springbuck, Eland, Blue Wildebeest and Red Hartebeest was noted. Their location on the reserve was also documented for spatial distribution data.

Vegetation survey progress

During the 2007 Earthwatch season, nine plots on the reserve were analysed by the Earthwatch volunteers. This involved plotting out a 200 square meter area at fixed points on the reserve in an Eastern aspect. Two hundred random sampling points are then taken by hitting a staff into the ground and assessing if vegetation was hit or not. All 'hit' data was then identified to species level where possible. This season thus provided an additional repetition on these existing plots of vegetation, to be added to the previous three years of data in order to monitor long term and seasonal variations in vegetation on the Reserve.

Vanzylsrus primary school progress

Visits to the primary school supplied the children with books, maps, stationary, sport equipment and other learning and playing materials. Interaction with the children differed tremendously between Earthwatch groups, but proved educational, interesting and definitely resourceful to the children. Updated requests from the school for specific needs were sent to volunteers, and contacts between foreign classes and children have been discussed. Progress was mainly made on possibilities for contact with outside schools, and additional funding for gifted children who are unable to fund a higher

education. Individual photos for the Grade 4 children were provided by group7 and will be used for report cards and as gifts to the parents who often do not have access to cameras.

Invasive alien plants removal progress

Large scale removal of Mesquite (*Prosopis grandulosa*) was undertaken in 2007 by the Working for Water programme that included follow up on previous removals, mapping of hotspots on the reserve and additional felling and poisoning of stumps. There are still large amounts of Mesquite on the reserve, but more felling and poisoning is scheduled for 2008.

c) Please provide a summary of your results (even if they are preliminary).

Meerkat Research

See publication list

Biodiversity surveys

Surveys totalled 97 burrows, 761 Grey Camelthorn trees (*Acacia haematoxylon*), 15 Shepherds trees (*Boscia albitrunca*), 65 termite mounds, 318 Camelthorn trees (*Acacia areoloba*) and 33 invasive Mesquite (*Prosopis grandulosa*) trees. Additionally, the location of 5 sociable weavers' nests and 13 white browed sparrow weaver's nests were documented. These nests may be useful in the search for future colonies to include in a possible study on these species. The location of the invasive plants facilitates their removal along with the 'Working for Water' programme, responsible for mass removal of invasive, water logging plants in South Africa. Furthermore, logging the presence of permanent structures such as trees allows for accurate reserve mapping and management. The presence of burrows in areas also signifies presence of several animals including the aardvark (*Orycteropsis afer*), the pangolin (*Manis temminckii*) and the Cape porcupine (*Hystrix africaeaustralis*) that are rarely seen due to their shy nature.

Game Surveys

Different numbers of game were documented on each game drive, and different areas of the reserve carried different types and numbers of game. Minimum and maximum numbers of game spotted on the reserve totalled the following:

Springbuck:	min 1- max 117
Gemsbok:	min 1- max 65
Eland:	min 1- max 12
Wildebeest:	min 1- max 21
Red Hartebeest:	min 1- max 9

Most game was spotted on the north eastern part of the reserve, with flat open grassy plains and close proximity of water.

Vegetation Surveys

Data revealed that only 14 to 28% of the land is typically covered with vegetation. Grasses account for 58-97% of the soil cover, while trees represent less than 1% and, forbes (type of plant) represents 27%. Twenty three percent of the vegetation was dead plant matter - mostly grass or annuals. Kalahari sourgrass (*Schmidtia kalahariensis*) is by far the most abundant grass over most of the reserve due to the land suffering from overgrazing in the past. Second in abundance is three thorn (*Rhigozum trichotomum*), a woody shrub with moderately palatable leaves. The flowers and pods are used by

Springbuck. Abundant grasses include species from the genera *Eragrostis* and *Stipagrostis*, providing average to good grazing. The highest diversity of vegetation is found in plots 2 and 7 as these were typically under grazed areas in the past, with the lowest diversity in plots 3, 5 and 6, these being highly overgrazed.

Significance/Benefits of Research

What is/are the significance/benefits of your research at the following levels?

- **local (in the area of the research site)**

The active removal of invasive alien plants in collaboration with the Working for Water programme facilitates the conservation of water in a water-deficient area. This also serves as an example to the local community, while providing employment for people from the local community.

The biodiversity, vegetation and invertebrate surveys also function as a monitoring programme for changes in the local Kalahari region, and will hopefully be incorporated into a larger management plan for the Kalahari in the future. Within the local area, the Kuruman River Reserve is the only area of protected land surrounded by farmlands on all sides. The rehabilitation of farmland to natural semi-desert status is a process set in motion by the creation of this reserve and can serve as an accurate documentation of the natural restoration process.

- **national**

Meerkat Research: Our joint research with the Universities of Pretoria, Stellenbosch and Cape Town has provided opportunities for collaborative research at our study site which have been welcomed by all three institutions. Our research also plays an important role in documenting ecological changes in the Kalahari where long-term biological studies are very scarce.

Biosurveys: Our survey data may provide a basis for further studies on aspects of general Kalahari ecology, either within the KRR or as part of a wider study. Also, we are always on the lookout for taxa new to the area (plants, invertebrates, etc.), and this information may ultimately benefit biogeographers, taxonomists or systematists.

- **international**

Meerkat Research: Our work is helping to extend our understanding of the biology of cooperative breeders (species whose individuals help in caring for young that aren't their own offspring) and the evolution of cooperation. On the one hand, this provides insight into the unusual problems faced by attempts to conserve cooperative breeders which commonly show positive correlations between reproductive success and population density instead of negative ones like most animals. These, in turn, cause temporary reductions in population size to have long lasting effects and increase the risk of group extinction. By providing an understanding of these processes, our work suggests how conservation policies should best be organised to deal with the problems of cooperative breeders.

On the other hand, our work provides close insight into the causal and evolutionary mechanisms that maintain animal cooperation which is relevant to understanding the evolution of cooperation in early humans and may even shed some light on the factors affecting cooperative behaviour in human populations today.



Figure 4. Demographic data on meerkats may help scientists to better conserve other co-operatively breeding species such as critically endangered African wild-dogs (*Lycaon pictus*), which by virtue of their enormous territories are notoriously difficult to study.

b) How do your findings contribute to issues of sustainability?

Biosurveys: Data collected in our surveys includes information on the distribution and abundance of Camelthorn (*Acacia areoloba*) trees. Over wide parts of their range, these trees are being heavily exploited for the domestic firewood industry, despite concerns over the sustainability of this practice. Our data may be useful in providing a scientific grounding for these concerns.

Furthermore, the sustainable use of the ungulate (hooved animal) populations on the reserve and the selected provisioning of land for small amounts of farm animals for the livelihood of local workers on the reserve promotes the long term livelihood of the people and environment.



Figure 5. The camelthorn, (*Acacia erioloba*), a keystone species in the Kalahari ecosystem, is heavily exploited in parts of its range as a source of firewood. Photo: H. Brettschneider

Dissemination of Results

- **Scientific papers (indicate status; e.g., peer reviewed or in progress/press)**

Clutton-Brock, T.H., Gaynor, D., Kansky, R., MacColl, A.D.C., McIlrath, G., Chadwick, P., Brotherton, P.N.M., O'Riain, J.M., Manser, M. and Skinner, J.D. 1998a. Costs of cooperative behaviour in suricates (*Suricata suricatta*). Proceedings of the Royal Society of London, B. 265: 185-190.

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Manser, M.B. and Avey, G. 2000. The effect of pup vocalisations on food allocation in a cooperative mammal, the meerkat (*Suricata suricatta*). Behavioural Ecology and Sociobiology 48: 429-437.

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Manser, M.B. 2001. The acoustic structure of suricates' alarm calls varies with predator type and the level of response urgency. *Proceedings of the Royal Society B*. 268: 2315-2324.

Manser, M.B., Bell, M.B. and Fletcher, L.B. 2001. The information that receivers extract from alarm calls in suricates. *Proceedings of the Royal Society B*. 268: 2485-2491.

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Russell, A.F., Clutton-Brock, T.H., Brotherton, P.N.M., Sharpe, L.L., McIlrath, G.M., Dalerum, F.D., Cameron, E.Z. and Barnard, J.A. 2002. Factors affecting pup growth and survival in cooperatively breeding meerkats *Suricata suricatta*. *Journal of Animal Ecology* 71: 700-709.

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Russell, A.F., Brotherton, P.N.M., McIlrath, G.M., Sharpe, L.L. and Clutton-Brock, T.H. (2003) Breeding success in cooperative meerkats: effects of helper number and maternal state. *Behavioural Ecology* 14: 486-492.

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Hodge, S.J., Flower, T.P. and Clutton-Brock, T.H. In press. Offspring competition and helper associations in a cooperative breeder. *Animal Behaviour*

Jordan, N.R., Cherry, M.I., Clutton-Brock, T.H. and Manser, M.B. In press. The spatial and temporal distribution of meerkat latrines reflects intruder diversity and suggests a role in mate-defence. *Animal Behaviour*.

Kutsukake, N. and Clutton-Brock, T.H. In press. Social function of allo-grooming in cooperatively breeding meerkats *Suricata suricatta*. *Animal Behaviour*.

Schibler, F. and Manser, M.B. Submitted. The irrelevance of individual discrimination in meerkat alarm calls. *Animal Behaviour*

Madden, J.R., Kunc, H-J., English, S., Manser, M. and Clutton-Brock, T. In prep. Cooperative begging in a cooperative mammal.

- **Popular articles or films (in progress or completed)**

Meerkat Manor, OSF films for Animal Planet

- **Books, chapters, illustrations**

Hollén, L. and Manser, M.B. 2005. Studying alarm call communication in meerkats. *Cognition, Brain, Behaviour*, Vol. IX(3): 525-538.

SECTION II: VOLUNTEERS

Volunteer Tasks and Accomplishments

a) How did the volunteers contribute ideas, skills, expertise and motivations beyond that which you anticipated?

The enthusiasm shown by the volunteers for the meerkats was inspirational and valuable in providing year-long volunteers with a fresh outlook on the project. Volunteers were eager in contributing to the improvement of the Earthwatch programme. New ideas as to the improvement of the association with the Vanzylsrus School were common and very useful.

b) How have volunteers helped you to achieve your research or educational objectives? Please give specific and quantitative measures of the volunteers' contribution to your data collection.

Data collected by Earthwatchers on meerkats were specific to foraging strategy and association with kleptoparasitic birds. This is a new avenue of research and all the preliminary data needed to formulate research objectives was collected by Earthwatch. In addition, the vegetation, biodiversity and invertebrate surveys are done solely by Earthwatchers and their time and effort ensures that continual monitoring of the reserve is done. Without these surveys, we would have no proof of changes occurring within our reserve, or in the Kalahari as a whole. Temporal changes in the climate affect a large variety of biological processes that inevitably impacts on the plants, animals and people living in this area.

Project Development

a) What logistical or scientific challenges have you encountered in the past season and how will you address them during the next field season?

The only logistical problems encountered were finding the best ways to teach the volunteers scientific principles, methods of data collection and the use of equipment. These are challenges that we will face again next year, but will deal with in the same manner we did this year. Simplifying the data collection protocol (without decreasing the value of data collected) and supplying the volunteers with a detailed field guide proved very successful.

b) Have you used any additional methods/strategies to meet your research objectives? If so, please describe them.

None.

c) How will you develop your research in the coming field season?

The foraging focal protocol was newly instituted in 2006 and more data were collected on this during 2007. Data collection pertaining to the forktailed drongo kleptoparasitism will continue, with slight changes in the protocol with the aim to explore a slightly different aspect of the association between the meerkats and these birds. The long term monitoring of the vegetation, invertebrates and biodiversity will continue since the

strength of the data lies in long term collections. Active monitoring of the ungulate populations was also instituted as a separate activity from the biodiversity surveys.

Educational Opportunities

a) Does your project directly or indirectly involve the following groups in your research topic?

- **Local communities**

The Vanzylsrus primary school forms part of an education and basic awareness programme instituted by the project. Further exposure of the local farming community, children and workers to behavioural science is maintained through our presence in the Kalahari.

- **Students**

Local and international students are directly and indirectly involved in data collection on the project. This is established either through postgraduate studies based on the project or through volunteer work.

- **Volunteers**

Apart from Earthwatch, volunteers come to the project to assist with data collection, remaining on the project for 12 months. These are mainly graduate students gaining experience in science with the aim of exploring postgraduate studies in the future. The Working for Water programme also makes use of volunteers from the local community to actively remove invasive plants on the reserve and local farms.

- **Early career scientists**

Volunteers are mainly graduate students gaining experience in science with the aim of exploring postgraduate studies in the future.

- **Other groups**

b) Please tell us the ways your research helps these groups better understand the conservation of a sustainable environment.

The volunteers and students on the project focus primarily on behavioural research and do not take part in the active monitoring of the plant and animal life on the reserve. They are, however, provided with meat from the game on the reserve that is culled in a sustainable manner to maintain the populations. The active removal of invasives is also an example to the local community, along with the creation of the reserve in the first place. We have a minimum of 13 researchers on the reserve at a time, along with three families of workers that live on the land and make a living off the land both by protecting it and utilizing it for wood and food.

c) Has your project helped lead to the completion of Masters' theses, or other educational research findings?

Yes.

Partnerships

a) List partnerships or collaborations with other organizations that you have developed or maintained in the past season.

Northern Cape Nature Conservation; Northern Cape Raptor Conservation Group; Vulture Study Group; Tswalu Desert Reserve; Department of Water Affairs "Working for Water" Programme; Stellenbosch University's Division for

Entrepreneurial Development; Northern Cape Economic Empowerment Company

b) How have these organizations contributed to your project objectives?

While these organisations have not contributed directly to our primary research goals, we have supported and worked alongside one another in our secondary objectives of conservation and the promotion of a sustainable local environment.

c) How do you anticipate these organizations will use the results generated by the project, and in what timeframes?

These specific organisations are unlikely to have use for the results of our meerkat work *per se*, which is of more academic appeal, but the data focussed on biodiversity may be of use to Northern Cape Nature Conservation within the next few years, in the formulation of new conservation policy.

Acknowledgements

The Kalahari Meerkat Project is supported by a multitude of organisations, including funding organisations such as BBSRC and NERC, and the Universities of Cambridge, Zurich, Pretoria and Cape Town. Discovery Channel and Oxford Scientific Films are greatly thanked for their widely acknowledged production 'Meerkat Manor', which resulted from three years' collaboration with the project. We express gratitude to local landowners H. Kotze, K. Kotze and F. de Bruin for access to their land when our meerkats roam outside our reserve boundaries.

On the outreach front, thanks must go to the Vanzylsrus Primary School, library and women's needlework group for granting us opportunities to interact with their learners.